WE CLAIM:

1. A method of controlling the torque transferred across each of the two clutches of a dual clutch transmission during a two-gear positive downshift, wherein the first of the two clutches drives an initial gear and the final gear and the second of the two clutches drives an intermediate gear, said method including the steps of:

sensing the speed of the driven member of the first clutch in the initial gear;

sensing the speed of the driven member of the second clutch in the intermediate gear;

estimating the speed of the driven member of the first clutch in the final gear;

determining a desired clutch torque and slip profile for the changeover of the clutches;

determining a target engine speed profile based on the speed of the driven member of the first clutch, the speed of the driven member of the second clutch, the estimated speed of the driven member of the first clutch for the final gear, and the desired clutch torque/slip profile;

simultaneously controlling the torque transfer across each clutch so that the torque output of the transmission will be changed over from the first clutch to the second clutch by linearly decreasing the torque transferred across the first clutch while linearly increasing the torque transferred across the second clutch in an inversely proportional rate to follow the clutch torque and slip profile and to cause the engine to track the target engine speed profile;

change over the gears driven by the first clutch by disengaging the synchronizer of the initial gear and engaging the synchronizer of the final gear as the engine tracks the target speed and the first clutch is slipping at a greater rate than the second clutch;

simultaneously controlling the torque transfer across each clutch so that the torque output of the transmission will be changed back from the second clutch to the first clutch by linearly

decreasing the torque transferred across the second clutch while linearly increasing the torque transferred across the first clutch in an inversely proportional rate to continue to follow the clutch torque and slip profile and to cause the engine to continue to track the target engine speed profile; and

continuously varying the pressure applied to the first clutch to cause the engine to continue to track the target engine speed profile so that vehicle acceleration is maintained once the first clutch is driving the final gear and is transferring all of the output torque.

2. The method as set forth in claim 1 further including the steps of:

determining a first time period during which the engine speed will be increased by decreasing the pressure applied to the first clutch based on the speed of the first clutch and the speed of the driven member of the second clutch; and

decreasing the pressure applied to the first clutch and increasing the pressure applied to the second clutch during the first time period to cause the engine speed to increase and track the target engine speed profile so that the torque output can be changed from the from initial gear to the intermediate gear while maintaining the increasing vehicle speed.

3. The method as set forth in claim 1 further including the step of determining a second time period during which the torque transfer across each clutch will be changed over from the first clutch to the second clutch.

4. The method as set forth in claim 1 further including the steps of:

sensing the speed of the driven member of the first clutch after the change over to the final gear; and

determining a third time period during which the torque transfer across each clutch will be changed over from the second clutch to the first clutch.

5. A method of controlling the torque transferred across each of the two clutches of a dual clutch transmission during a positive downshift, wherein the first of the two clutches drives an initial gear and the final gear and the second of the two clutches drives an intermediate gear, said method including the steps of:

sensing the engine throttle position and the vehicle speed;

determining if a two-gear positive downshift is required based on the engine throttle position and the vehicle speed;

sensing the speed of the driven member of the first clutch in the initial gear;

determining the clutch torque and slip profile for the changeover of the clutches;

sensing the speed of the driven member of the second clutch in the intermediate gear;

estimating the speed of the driven member of the first clutch in the final gear;

determining a target engine speed profile based on the speed of the driven member of the first clutch, the speed of the driven member of the second clutch, the estimated speed of the driven member of the first clutch for the final gear, and the desired clutch torque/slip profile;

determining a first time period during which the engine speed will be increased by decreasing the pressure applied to the first clutch based on the speed of the first clutch and the speed of the

driven member of the second clutch;

decreasing the pressure applied to the first clutch and increasing the pressure applied to the second clutch during the first time period to cause the engine speed to increase and track the target engine speed profile so that the torque output can be changed from the from initial gear to the intermediate gear while maintaining the increasing vehicle speed;

determining a second time period during which the torque transfer across each clutch will be changed over from the first clutch to the second clutch;

simultaneously controlling the torque transfer across each clutch so that the torque output of the transmission will be changed over from the first clutch to the second clutch by linearly decreasing the torque transferred across the first clutch while linearly increasing the torque transferred across the second clutch in an inversely proportional rate to follow the clutch torque and slip profile and to cause the engine to track the target engine speed profile;

disengaging the synchronizer of the initial gear and engaging the synchronizer of the final gear as the engine tracks the target speed and the first clutch is slipping at a greater rate than the second clutch to change over the gears driven by the first clutch;

sensing the speed of the driven member of the first clutch after the change over to the final gear;

determining a third time period during which the torque transfer across each clutch will be changed over from the second clutch to the first clutch; and

simultaneously controlling the torque transfer across each clutch so that the torque output of the transmission will be changed back from the second clutch to the first clutch by linearly decreasing the torque transferred across the second clutch while linearly increasing the torque

transferred across the first clutch in an inversely proportional rate to continue to follow the clutch torque and slip profile and to cause the engine to continue to track the target engine speed profile.